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NOTES ON FISHES OF THE GENUS *EUSTOMIAS*
(STOMIATOIDEI, MELANOSTOMIATIDAE) IN
BERMUDA WATERS, WITH THE DESCRIPTION
OF A NEW SPECIES

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This study is based on 69 specimens of 14 species of the genus *Eustomias* Vaillant, collected between 1968 and 1970 in Bermuda waters on 10 cruises of the Ocean Acre program (Gibbs and Roper, 1971). In their comprehensive treatment of North Atlantic *Eustomias*, Regan and Trewavas (1930) recorded only one species, *E. obscurus*, from the immediate vicinity of Bermuda. Borodin (1930) described a second species, *E. radificifilis*, from this area. Beebe and Crane (1939) reported on 24 specimens of nine species collected in 1,574 nets, mostly during 1929-1931, raising to 10 the number of species known from the area. Grey (1955) recorded four species collected in 1948, all of which had been treated by Beebe and Crane, but her specimen identified as *E. obscurus* has proved to be an eleventh Bermuda species, *E. enbarbatus* (Morrow and Gibbs, 1964: 407). Eight of these 11 species are recorded here from the Ocean Acre collections, together with six previously unrecorded species, one of which is described as new. The additions raise the total number of *Eustomias* species known from the vicinity of Bermuda to 17.

Ocean Acre collections have been made in March, April, June, July, September, October, November and December. The single November and December cruises were abortive, and the few collections yielded no *Eustomias* specimens. One or more species were taken during each of the other eight cruises, between March and October. One cruise used a 6-foot (2 m)



FIG. 1. *Eustomias decoratus* new species, Holotype, USNM 205494, 255.5 mm SL.

Isaacs-Kidd Midwater Trawl (IKMT); all others used a 10-foot (3 m) IKMT. On four cruises, the discrete-depth cod-end sampler described by Aron et al. (1964) was used successfully with the IKMT. Much larger Engel trawls (the largest about 58-m wide at the mouth) were used for 10 tows on one cruise. A total of 197 trawls has been made as of this writing.

BERMUDA SPECIES OF *EUSTOMIAS****Eustomias decoratus*** new species

Figure 1

Holotype: National Museum of Natural History (USNM) 205494, a female with flattened, transparent gonads and very small eggs, standard length 255.5 mm, USNS Sands, Acre 6-17P, 29 April 1969, 32°19' N, 63°37' W, 0-235 m, 0300-0420 hrs. zonal time, 10'IKMT.

Description: Dorsal rays 24; anal rays 44; pectoral rays 14 (left) or 15 (right); pelvic rays 8 on both sides. Photophores: IP 7, PV 30, VAV 13, ending over anal ray 10, OV 31, VAL 13, AC 23. Premaxillary teeth on left side 12, numbers 1,2,4-6, and 8-12 depressible; on right side 13, numbers 2,4-6, 9-13 depressible; second tooth longest. Maxilla with small serrae. Mandibular teeth on left side 18, numbers 2-5, 7-11, 13-18 depressible; on right side 17, numbers 2-5, 7-9, 11, 13-17 depressible; number 11 longest, but only slightly longer than number 2. No teeth on vomer or palatines. Three pairs of teeth on basibranchials. No gill rakers or teeth. Branchiostegal photospores 11. Vertebral centra unossified just behind cranium, leaving space about three times length of first ossified, vertically-oriented centrum, followed by another longer space, followed by a continuous row of one small ossification and 60 well-developed centra.

Measurements, followed by percent of standard length in parentheses: snout to dorsal origin 222.0 (86.8), snout to anal origin 180.2 (70.5), snout to pelvic insertion 141.7 (55.4), greatest depth, just behind head 15.3 (6.0), caudal peduncle depth 3.7 (1.4), head length 29.4 (11.5), snout to fleshy orbit 9.3 (3.6, 31.6% of head length), fleshy orbit length 4.5 (1.8, 15.3% of head length), bulb of postorbital organ 2.3 (7.8% of head length, 51% of fleshy orbit), upper jaw length 24.5 (9.6, 83.3% of head length), longest premaxillary tooth 3.8 (12.9% of head length), longest mandibular tooth (No. 11) 2.7 (9.2% of head length), barbel overall length 130.9 (51.5, 445% of head length), barbel main stem overall length 95.2 (37.2, 324% of head length), barbel stem to origin of branches 28.4 (11.1), length of longest (middle) branch of barbel 102.5 (40.1), length of terminal bulb on main stem 4.1 (1.6, 13.9% of head length), length of largest bulb in middle branch 5.1 (2.0, 17.3% of head length), pectoral-fin length 41.5 (16.2), pelvic-fin length 22.8

(8.9), length of dorsal-fin base 26.8 (10.5), length of anal-fin base 68.1 (26.6).

Barbel with three branches arising from main stem. Middle branch about as thick as adjacent main stem, thicker than two side branches, extending beyond main stem, with a prominent bulb near its midlength, and with numerous filaments of various sizes. Two side branches about half as long as middle branch, relatively simple with fewer filaments than middle branch, each branch ending in a very small bulb. Michael J. Keene recorded that the barbel bulbs were colored yellow in the freshly-caught specimen.

Head and body black, without visible patches of lighter material. All fin-rays dark, the membranes, now damaged, apparently transparent. Main stem of barbel mostly black except the distal end; terminal bulb and distal three-fifths of main stem beyond branches surrounded by translucent tissue. Middle branch and its larger filaments black except for bulbs; side branches pigmented, but much lighter than middle branch.

Comparisons: This new species is easily identified by its high pectoral-ray count (14–15 rays), 8 pelvic rays, and unique barbel configuration.

The count of 14–15 pectoral rays is approached only by *E. macrurus* (up to 11) and *E. braueri* (up to 16); both species have shorter barbels than *E. decoratus*, seldom twice as long as the head, and lacking branches; *E. macrurus* is the only species of *Eustomias* with an opaque tissue mass (luminous body) in the ventral lobe of the caudal fin in specimens larger than about 100 mm.

Most species of *Eustomias* normally have 7 pelvic rays. Other than *E. decoratus* (presuming 8 rays to be its usual complement), only *E. braueri* (see preceding paragraph), and four other species, usually or always have 8 pelvic rays. Of these four species, *E. tenisoni*, *E. fuscifer*, and *E. drechseli* have barbels somewhat similar in structure to that of *E. decoratus*, although shorter (up to about 35% of SL compared to about 50% in *E. decoratus*), and have only 4 to 8 pectoral rays. The fourth species, *E. radicipilis*, has an entirely different barbel, with very long branches arising from the stem at the base of the terminal bulb, and has 7 pectoral rays.

In barbel structure, nine other presently recognized species resemble *E. decoratus* in having three branches either arising together from the main stem or arising from a single short trunk (Morrow and Gibbs, 1964: 382–383). None of these has more than three pectoral rays.

Etymology: The name *decoratus* is a Latin adjective alluding to the spectacular barbel of the new species.

Annotations on each of the remaining species will be in the following order: (1) number of specimens taken during Ocean Acre cruises 1–10 (range of standard lengths in mm); (2) months when specimens were caught; (3) depth range and number of specimens caught in that range based on daytime hours or combined night and dusk hours (for non-discrete samples, the depth range is for the greatest trawling depths, with the possibility that specimens may have been caught at any point between

the greatest depth and the surface); (4) reference to Beebe and Crane (1939) and Grey (1955); (5) miscellaneous comments.

Eustomias bibulosus: 8 (62–136), June–October. No daytime samples. Night and dusk discrete depths: 50–100 m (3), 400–500 m (1). Night and dusk non-discrete depths: 400–500 m (2), 1250–1750 (2). Beebe and Crane reported eight specimens (42–123 mm SL), April–September, from daytime non-discrete depths of 914–1646 m. Grey reported one specimen (125 mm), July, non-discrete 260–275 m at night.

Eustomias bigelowi: 3 (81–136), March and September. All three taken at night in non-discrete samples: 150–200 m (1), 200–300 m (1), 300–400 m (1). Beebe and Crane reported two specimens (108 and 134 mm), May and August, from daytime non-discrete depths of 1280 and 1463 m. Grey reported one specimen (103 mm), August, non-discrete 200 m at night. It is possible that *E. binghami* and *E. silvescens* (see below) are synonymous with *E. bigelowi*; their identifications here are tentative and the three should be considered together.

Eustomias binghami: 2 (69 and 135), June. No daytime samples. Night discrete depth: 50–100 m (1). Night non-discrete depth: 200–300 m (1). Not previously reported from Bermuda. These specimens possibly referable to *E. bigelowi*.

Eustomias silvescens: Not taken by Ocean Acre cruises. Beebe and Crane reported one specimen (140 mm), September, from the daytime non-discrete depth of 1829 m. This specimen possibly referable to *E. bigelowi*.

Eustomias dubius: 3 (47–110), June and October. Night and dusk discrete depths: 50–100 m (1). Dusk non-discrete depth: 150–200 m (1). Beebe and Crane reported three specimens (43–115 mm), May to October, from the daytime non-discrete depth of 1097 m.

Eustomias enbarbatus: 11 (47–128 mm), March to October. Daytime discrete depth: 700–800 m (2). Night and dusk discrete depths: 50–100 m (3), 100–150 m (1). Night and dusk non-discrete depths: 0–50 m (2), 100–150 m (1), 200–300 m (2). Grey reported one specimen (as *E. obscurus*) (120 mm), August, night non-discrete 500–550 m. This is the second most numerous species of *Eustomias* in the Ocean Acre collections.

Eustomias filifer: 3 (46–133), July and October. Daytime discrete depth: 500–600 m (1). Night non-discrete depths: 600–700 m (1), 1750–2000 m (1). Not previously reported from Bermuda waters.

These three specimens of *E. filifer* differ in the morphology of their barbels from all other specimens of this species that I have examined. Specimens from the northeastern Atlantic, Gulf of Mexico, southwestern Atlantic, and Indian Ocean, as well as illustrations of the holotype of *E. filifer* Gilchrist, all have a barbel with three variable branches arising from the main stem, beyond which is an ovoid or ellipsoidal swelling, followed by a long, slender continuation of the stem that ends in a small terminal bulblet (see Morrow and Gibbs, 1964: 389, Fig. 105). In the Bermuda specimens (Fig. 2) distal to the three short branches is an elongate,

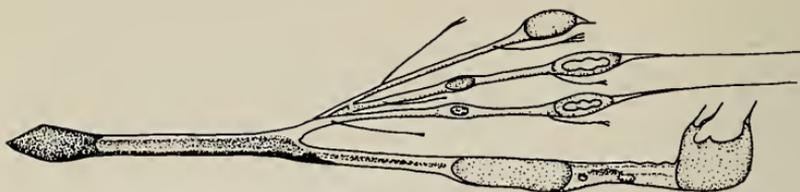


FIG. 2. Barbel of *Eustomias filifer*, 130.2 mm SL, from Ocean Acre, cruise 3, trawl 1.

somewhat irregular swelling, beyond which a short section of stem, undiminished in width, precedes a large terminal bulb of distinctive shape. In all other respects, the Bermuda specimens are indistinguishable from other *E. filifer*.

Eustomias longibarba: 2 (102, 116), September. Night discrete depth: 150–200 m (1). Night non-discrete depth: 300–400 m (1). Not previously reported from Bermuda waters.

Eustomias macrurus: 1 (165), April. Daytime non-discrete depth: 800–900 m (1). Not previously reported from Bermuda waters.

Eustomias obscurus: 27 (67–207), March–September. Night and dusk discrete depths: 0–50 m (2), 150–200 m (1), 800–900 m (1). Night and dusk non-discrete depths: 0–50 m (3), 50–100 m (1), 100–150 m (5), 150–200 m (2), 200–300 m (2), 300–400 m (2), 400–500 m (5), 500–600 m (1), 700–800 m (1). Beebe and Crane reported five specimens (51–98 mm), May to September from daytime non-discrete depths of 914–1280 m. The specimen reported by Grey has been reidentified as *E. enbarbatus*. *Eustomias obscurus* is by far the most abundant species of *Eustomias* in the Ocean Acre collections.

Eustomias parri: 1 (128), September. Night non-discrete depth 100–150 m (1). Not previously reported from Bermuda waters.

Eustomias radicefilis: 2 (183–192), September. Night and dusk non-discrete depths: 150–200 m (1), 200–300 m (1). Known previously only from the holotype, also collected near Bermuda at 33° N, 64' W.

The following are counts of the two Ocean Acre specimens (both females), those of the 182.5 mm specimen followed by those of the 191.7 mm specimen. Dorsal rays 23,21. Anal rays 41,40. Pectoral rays 7,7. Pelvic rays 8,8. Photophores: IP 7,7; PV 29,27; VAV 12,13; OV 29,27; VAL 13,14; AC 22,20. Premaxillary teeth 12,12. Mandibular teeth 17–19, 18. Because the head of the 191.7 mm specimen is damaged, measurements of only the 182.5 mm specimen are given (in mm). Snout to dorsal origin 159.2, snout to anal origin 137.5, snout to pelvic insertion 108.6, head length 24.0, barbel length to end of terminal bulb 44.8, length of pre-bulbar branches 45.2, length of terminal bulb 2.5, length of single distal filament of terminal bulb 13.0, snout to fleshy orbit 11.1, fleshy orbit 3.9, length of postorbital organ (bulb) 1.6, distance from postorbital organ to fleshy orbit 1.4, upper jaw length 18.2,

depth of body behind head 11.8, greatest body depth 13.2, caudal peduncle depth 2.4, pectoral length 41.9, pelvic length (broken) at least 12.7. Length of dorsal base 19.5, length of anal base 45.5. Tooth sizes vary from left to right side. On the left side, longest premaxillary tooth (No. 6) 2.8, longest mandibular tooth (No. 11) 2.6. On the right side, longest premaxillary tooth (No. 2) 2.6, longest mandibular tooth (No. 10) 2.4.

The barbel in both specimens is similar to that of the holotype (Gibbs and Morrow, 1964: 388, Fig. 103).

Eustomias schmidti: 2 (95–202), March and October, Dusk discrete depth: 100–150 m (1). Night non-discrete depth: 50–100 m (1). Beebe and Crane reported two specimens (55–118 mm), July and September, from daytime non-discrete depths 1280 and 1463 m. Grey reported one specimen (39 mm), July, night and dusk non-discrete depth of 730–820 m.

Eustomias simplex: 3 (100–118), June. Night discrete depth: 50–100 m (3). Beebe and Crane reported one specimen (91 mm), May, from the daytime non-discrete depth of 1097 m.

Eustomias lipochirus: Not taken by Ocean Acre cruises. Beebe and Crane reported one specimen (50 mm), September, from the daytime non-discrete depth of 914 m.

Eustomias fissibarbis: Not taken by Ocean Acre cruises. Beebe and Crane reported one specimen (130 mm), September, from the daytime non-discrete depth of 1463 m.

Size: Of the 69 Ocean Acre *Eustomias* specimens, 16 (23%) are between 46–75 mm SL; 42 (61%) are 75–150 mm; 11 (16%) are 150–258 mm. Of 23 specimens larger than 125 mm, the majority (13, 57%) were taken in seven hauls by the very large Engel trawls towed at night between 125 and 520 m in September. Of eight specimens larger than 175 mm, six (75%) were taken in three of these same Engel trawls. From this it is apparent that our IKMT's are not sampling the larger individuals adequately.

All four specimens (of three species) smaller than 50 mm were taken in October with the smaller (2-m) IKMT, suggesting the possibility that this net samples smaller specimens better than does the 3-m IKMT. All four, however, are 46 to 50 mm SL, and their presence only in October may indicate an earlier breeding peak.

Vertical Distribution: Some inferences concerning the vertical distribution of *Eustomias* may be considered, even though the numbers of any given species are small. In spite of considerable daytime trawling in the upper 500 m, only five specimens have been taken in daytime trawls. Of these, three were taken at known depths: one at 500–600 m, two at 700–800 m. Two others were taken in open nets that fished horizontally at 700–900 m. It appears, therefore, that *Eustomias* almost certainly does not normally occur above 500 m during the daylight hours. About one-third as much daytime trawling has been done between 500–1000 m, where all five specimens were caught. Gibbs and Roper (1971) indi-

cated that the largest daytime fish concentrations in the Ocean Acre, in terms of volume or of species, are between 600–1100 m. Daytime trawling effort about equal to that in the 500–1000 m stratum, mostly with open nets, has been expended below 100 m, mainly between 1000–2000 m, but no *Eustomias* were caught. It thus seems highly probable that most *Eustomias* individuals live at 600–1100 m during the day.

The main night distribution of *Eustomias* is clearly in the upper 200 m. Of 20 night-caught specimens taken at known depths, 18 were in this upper stratum; one was taken at 400–500 m and one at 800–900 m. The open-net catches are not conclusive. Of 44 specimens, 19 were taken in the upper 200 m, 19 in trawls fished between 200–500 m, and six in trawls fished deeper than 500 m (500–800 m, three specimens; 1250–2000 m, three specimens). Eleven of the 14 species in the Ocean Acre collections have been taken in the upper 200 m at night, of which two species were taken in the upper 50 m and seven between 50 and 100 m.

Seasonal Abundance: Only three species are represented in the Ocean Acre collections by more than three specimens: *E. obscurus* (27), *E. enbarbatus* (11), and *E. bibulbosus* (8). The following interpretations are suggested concerning their seasonal abundance.

Eustomias obscurus, which is the dominant species of the genus, occurs only in the Atlantic, both north and south, and it has been the most abundant species overall in Atlantic collections. In the Ocean Acre area, it was taken from March to September. Because November and December cruises were abortive, it is not certain whether the species is present, rare, or absent from November through February; it may be that *E. obscurus* leaves the area during the winter. Two extensive cruises were made at almost exactly the same date in early September 1968 and 1969; in 1968 no *E. obscurus* were caught, whereas in 1969, 10 specimens were taken. It is suggested that *E. obscurus* disappears from the area about this time, and did so earlier in 1968 than in 1969. On an extensive cruise in late October, 1967, no *E. obscurus* were taken.

Nine of the 11 specimens of *E. enbarbatus* were taken in June (5) or late October (4). Although three cruises undertook collecting, only a single specimen was taken between June and October; and three cruises (two of them extensive) in March and April collected only a single specimen. If there are peaks of abundance in June and October, the reasons are not clear.

One or two specimens of *E. bibulbosus* were taken on each of the five cruises between June and October. These allow no conjecture as to seasonal abundance.

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